Olin CHEMICALS
P.O. BOX 248, LOWER RIVER ROAD, CHARLESTON, TN 37310
PHONE: (615) 336-4000

June 22, 1992

VIA FEDERAL EXPRESS

3689

Cheryl W. Smith
Senior Remedial Project Manager
United States Environmental Protection Agency
345 Courtland Street Northeast
Atlanta, Georgia 30365

Re: Response to EPA Technical Review Comments
Sampling and Analysis Plan
Olin Chemicals/McIntosh Plant Site
McIntosh, Alabama

Dear Ms. Smith:

Olin Corporation's response to EPA's comments, dated May 21, 1992, on the Revised Sampling and Analysis Plan (SAP)* submitted to EPA on April 2, 1992, is attached. It has been four months since Olin and EPA met to discuss the supplemental sampling required to characterize the site. The time required for submitting, receiving comments on, responding to, and obtaining approval for plans to proceed is becoming a concern to us. We need to expedite the field work related to this sampling, keeping in mind EPA's goal to streamline remedial investigations to gather data needed to assess risk and plan remedies for the site.

We intend to submit the Phase III Sampling and Analysis Plan, incorporating the changes as described in the attachment hereto, on June 26, 1992.

Please let me know if you have any questions regarding this submission or work in progress at McIntosh, Alabama.

Sincerely,

OLIN CORPORATION

J. C. Brown
Manager, Environmental Technology

*_This document will be renamed Phase III Sampling and Analysis Plan, in accordance with EPA's suggestion, when it is resubmitted. Although it will be entitled Phase III, the reader should refer to previous Sampling and Analysis Plans for this site since many procedures in Phase III are the same as those approved previously. These voluminous procedures are not necessarily reprinted in the Phase III document._

\jcb\131
Attachment

cc: W. A. Beal
D. E. Cooper (2)
W. J. Derocher (w/o att.)
M. L. Fries (w/o att.)
W. G. McGlasson (w/o att.)
J. L. McIntosh (w/o att.)
T. B. Odom
R. A. Pettigrew

Woodward-Clyde Consultants

RESPONSES TO EPA's TECHNICAL REVIEW OF REVISED SAMPLING AND ANALYSIS PLAN OLIN CORPORATION MCINTOSH, ALABAMA

3 2 1308

GENERAL COMMENTS

Comment 1: **Many grammatical and typographical errors occur throughout the document. It is recommended that the document undergo a thorough in-house editorial review.**

Response: A thorough in-house editorial review will be conducted of the document.

Comment 2: **The title of the document, "Revised Sampling and Analysis Plan," is confusing. Change document title to Phase III Sampling and Analysis Plan (SAP), since this is not a revision to a previously approved SAP.**

Response: The title of the document will be changed to Phase III Sampling and Analysis Plan (SAP).

Comment 3: **Section 2.1.1 of the text presents a combination of 10 Solid Waste Management Units (SWMU) and Areas of Concern (AOC) that have been identified in the RCRA Facility Assessment (RFA) as requiring further investigation. Other SWMUs and AOCs found by the RFA to need further investigation are discussed in Table 1; the discussion includes a suggestion for meeting the RFA recommendation. However, AOC E, four former underground storage tanks that were found by the RFA to need further investigation, is not discussed in any section of the SAP. AOC E should be discussed in the text, and, if sampling is required, the proposed sampling should be part of this document. Provide documentation to support rationale for not sampling this area, if applicable.**

Response: AOC E (the four underground storage tanks) will be added to Table 1. Olin believes that no sampling is required at these USTs. The RFA indicated that there was no evidence of a release from these tanks and suggested that Olin submit further documentation for accurate assessment of their potential for a release. Olin will address AOC E by submitting additional documentation.

In addition, the RFA identified the plugged brine injection wells as a SWMU. The SAP does not provide a proposal to confirm the presence or absence of contaminants emanating from these sources. Provide a proposal that discusses the likelihood of contaminant migration, the sensitivity of the monitoring equipment associated with these wells, and the location of the plug (i.e., depth) in each well. The proposal should also include monitoring wells that would detect migration of contaminants if the wells were to fail. Provide a figure that identifies the location of the injection wells as well as associated monitoring wells.

Response: Olin has concluded, based on existing experience, data, and research that additional monitor wells will not give any more meaningful information than we presently have. This is due to the particular geology of the area (i.e., presence of the salt dome in the graben formed by the unnamed fault to the west and the Jackson fault to the east). The following is evidence that indicates there is no communication between the fresh waters of the Miocene Aquifer above the salt dome and the salt waters in the salt and cap rock cavities: 1) the equilibrium conditions of the plugged wells from pressure readings prior to plugging; 2) the cavity volume stability; 3) the lack of chloride content of the Miocene groundwater as indicated by chemical analyses of groundwater wells in the vicinity of plugged brine wells 1 and 2; and 4) and the different static levels in the water and brine wells. The self healing characteristics of domal salt would also support the unlikeliness of the cavities to fracture in the future. Details of this summary of evidence leading to the conclusion that there is no migration from the brine wells are discussed below.

There is regional information that indicates locally high salt concentrations in Miocene groundwater. The areas of high salt generally do not occur near the Olin McIntosh facility. However, the source of the salt is discussed below for your information. The

dissolving of the exterior of the salt dome to form the cap rock plus the effects of the fault displacements of the deep Louann salt is believed by geologists to cause the surface salt springs and the generally shallow depths of the locally high dissolved solids content of the Miocene groundwater (U. S. Geological Survey). It has been historically documented that settlers of the Lower Tombigbee River in the late 18th century recovered salt from "salt springs". The spring flow that seeped from the ground was collected and boiled until it evaporated (Pearson, 1958). In addition to saltwater from the cap rock, geologists familiar with this area believe that salt water flow also occurs as a result of the outcropping of salt fingers originating from the Louann salt formation being dissolved by groundwater. The natural hydrogeological pressure then pushes it to the surface.

In 1948 the McIntosh dome, a piercement salt dome, was located by exploratory work of Humble Oil and Refining Co. of Houston, TX and several other supporters. Core samples and drilling records determined that cap rock associated with the dome started at approximately 285 feet below the surface and solid salt existed at a depth of approximately 405 feet below the surface. The dome has a diameter of approximately 7000 feet and is estimated to originate from the Louann Salt at 20,000 feet depth (Halbouty, 1979a).

The most direct evidence that there has been no migration from the brine cavities is the sampling of a water well downgradient from two brine wells that incurred problems during early operations. The Olin McIntosh Brine Wells 1 and 2 were drilled in 1951 and failed due to lost circulation of brine in early 1953 in a zone between the bottom of the cap rock and solid salt. These wells were then operated by air lift until 1957. Olin has determined that no brine has moved up through the cap rock or the cemented casing of the well borehole past the lost circulation zone into the Miocene groundwater aquifer above the dome. In 1965 a sonar caliper log indicated the lost circulation zone to be from 370 feet to 405 feet below the surface. In 1972 Brine Well 1 was plugged at the bottom of the cemented casing at 450 feet. An interface log on brine well 2 in 1982 confirmed the lost circulation zone shown on the 1965 sonar log and a tight borehole suitable for plugging of well 2 at 340 feet in 1985. At the same time a 194 feet deep water well, 60 feet downgradient and used for service in the brine field, was tested and confirmed that no saltwater intrusion has resulted from the well operations or

standby condition. The results were 13.0 ppm chloride, 6.2 pH, non-detectable mercury, and a static well level comparable to other process water wells in the Miocene aquifer.

Other pertinent data from the interface logs showed that no long term cavity volume increase or decrease was noted indicating no salt dissolution or cavity closure had occurred and that equilibrium conditions existed in the wells. In other words no liquid level conditions had changed in the wells.

As a result of information gained from wells 1 and 2, brine wells 3-6 were constructed with an additional casing cemented into the salt and operated with an oil pad in top of the cavity to prevent dissolution of the cavity roof. Daily pressure readings were taken and recorded verifying the integrity of the well cavities and their conducts for injection fluid into the cavity and for liquid brine return to the surface.

In 1985 Olin received a Class III Well Underground Injection Control Permit. This permit required supporting of pressures of the wells 3-6 while in their standby condition which began in December 1982. Pressure guages were under a strict quarterly preventive maintenance program inspected at least quarterly by ADEM. The sensitivity of the pressure guages was 0.5% on a 0-600 psi guage. In 1988 a plugging plan was submitted to, and approved by, ADEM for the closure of these wells.

Hydrostatic pressure tests on the Underground Injection Control permitted wells 3-6, drilled between 1954 and 1967, have verified the integrity of not only the borehole with cemented casings but also the well cavity.

Further support of the unlikelihood of brine movement out of the wells is established geophysical research that cavities in domal salt frequently experience gradual closure over a long period of time (Halbouty, 1979b).

Data gathered from the time period of the standby condition brine wells from 1982 until plugging in 1988 showed a gradual increase of pressure in the wells which finally stabilized at equilibrium pressures less than permit allowable pressure of 0.9 psi per foot of depth. Subsequent research (Thoms and Gehle, 1990) showed actual fracture pressures of McIntosh dome salt to be 526 + 1.44 psi per ft. of depth. This high

fracture gradient is further supported by uniaxial compression tests performed on McIntosh Dome salt cores which showed compressive strength values ranging from 3552 psi to 7740 psi, compared to 2000-2500 psi compressive strengths found in other salts (Thoms and Gehle, 1990). In other words, the pressures during well operation and now could never fracture the salt.

Comment 4: **The descriptions of each closed SWMU or AOC presented in the text should identify the regulations under which each unit was closed (for example, Alabama Department of Environmental Management or U. S. Environmental Protection Agency), if applicable, and the date of closure. This is important for identifying areas that might not have been closed adequately and that might be contributing contamination to the site.**

Response: The decommissioning of process areas (such as the mercury cell plant) and removal of process ponds (such as the strong brine pond) were not subject to regulations of either ADEM or EPA. However, the strong brine pond closure was included in the scope of work for closure of the weak brine pond, a RCRA unit. Some of the SWMU closures occurred prior to promulgation of EPA/ADEM's regulations regarding closure. The dates of closure and the regulations under which each unit was closed will be added to the text (where applicable). The text will also identify the units where closure, decommissioning or removal activities were not regulated by ADEM or EPA.

Comment 5: **Provide a proposal for sampling of wells screened in Miocene aquifer to confirm the presence or absence of site contaminants at this level.**

Response: Four Miocene Aquifer wells have been sampled as part of the site characterization activities. The results of this sampling are provided in the Preliminary Site Characterization Summary (PSCS), which was submitted to EPA on April 16, 1992. The PSCS includes recommendations for further evaluation of the Miocene Aquifer. The recommendations are summarized below.

Olin continuously pumps approximately 1000 gpm from each of two process water wells screened in the Miocene Aquifer. This process water is required for operation of the facility's production process. Groundwater flow in the Miocene Aquifer is believed to be generally towards the two pumping wells. The recommended evaluation presented in the PSCS includes the use of analytical models to assess the cones of depression generated by the process water wells. The site characterization sampling data and these modeled cones of depression will be used to address the Miocene Aquifer as follows:

- To evaluate the potential for constituent migration away from the facility in the Miocene Aquifer.

- To evaluate whether additional existing process water wells should be sampled to evaluate the horizontal extent of constituents in the Miocene Aquifer.

- To evaluate whether additional Miocene Aquifer monitor wells should be installed to determine the horizontal extent of constituents and if so, to determine the appropriate locations for these additional monitor wells.

Comment 6: **The relative health of the basin can only be determined from an adequate description of the community in the basin by way of comparisons to expected community and population structure and abundance. Provide a plan to sample the biota which includes trophic levels that will provide a determination of accessibility to upper level organisms (i.e., fish eating birds, etc.). Invertebrate and vertebrate food items for avian species, such as earthworms and small mammals, as well as a predator snake species, would be appropriate target species.**

Response: Olin completed an evaluation of the community structure and relative health of the basin using the procedures approved by EPA under the amended work plan (May 25, 1991). EPA has not had the opportunity to review the evaluation that has already been completed regarding the basin community health and structure because it was

submitted after the SAP. This evaluation was provided in the Preliminary Site Characterization Summary (PSCS), which was submitted to EPA on April 16, 1992. Sections 2.2 (especially Sections 2.2.5 through 2.2.7) and 4.2 (especially Section 4.2.5) of the PSCS describe the biological community structure in the basin. Specifically, these sections provide floral and faunal species lists; evaluations of relative abundance, and in some cases, specific quantitative abundance for the various floral and faunal species; and provide descriptions and discussions of the communities represented by the various species assemblages. The information provided lends insight into trophic relationships and community dynamics. The results of the work described in the referenced document depict a relatively rich biological community, considering the annual dramatic water level fluctuations to which the basin community is subjected. Finally, "worst-case" fish species (a top carnivore and a bottom feeder) were chemically analyzed to assess contaminant impacts on the biological community. Such specimens represent the bioaccumulation and bioconcentration of the contaminants in the trophic levels under them. Additional interpretations regarding the relative health of the basin will be provided in the Environmental Evaluation Technical Memorandum, which will be submitted at a later date. It is premature to suggest additional sampling prior to EPA's review of results of sampling already conducted under the work plan.

Provide a proposal for further sampling of basin sediments which contain high levels of Mercury and Hexachlorobenzene are recommended to determine the maximum vertical extent of contamination.

Response: The chemical and lithological data from Phase I and Phase II, when interpreted together, reveal a significant picture of the vertical extent of contamination. Additional core samples in the basin would not significantly improve the picture. The comment suggests further sampling at locations which contained high levels of mercury and hexachlorobenzene to determine the maximum vertical extent of contamination. This sampling has been done. Two of the Phase II basin cores were completed at locations I-7 and E-2, which had high mercury and hexachlorobenzene concentrations as determined by the Phase I grab samples. The results of the mercury and hexachlorobenzene analyses for these two core samples were presented in Table 4 of the SAP. Mercury and hexachlorobenzene were not detected in the 3- to 4- foot interval

or below in Core I-7, and were not detected in the 5- to 6- foot interval or below in core E-2.

With the Phase I and Phase II activities, five cores have been completed in the basin at four different locations. An additional core was completed adjacent to the basin in the former wastewater ditch. The data from the cores indicate that the vertical distribution of constituents in the basin is generally related to the sediment type and depositional history rather than the concentrations reported in the basin grab samples. To illustrate this, a geologic cross section of the OU-2 sediments is attached to these responses as Figure 1. A relatively thin unit consisting of tan, black and dark gray silty clays and clayey silts was encountered in all five cores, with a maximum thickness of about 5 feet found in the vicinity of cores C-2/C2-2 and C-3 (located near the former discharge ditch to the basin). The unit gradually thins to approximately 1 foot thick in the eastern half of the basin at core C-1. Interspersed throughout this unit are fine, medium and coarse-grained sands up to 1.5 inches thick. The thicker portions of this silty clay/clayey silt unit are interpreted to be deposits from the sediment carried down the wastewater ditch, possibly the result of increased sedimentation due to plant operations. A dark gray, organic silty clay unit was encountered in all cores at approximately the same depth relative to the basin water level. This dark gray unit is interpreted to be a flood plain deposit of the adjacent Tombigbee River. The maximum vertical extent of constituents at detectable concentrations was found at C2-2 (about 7 feet). Approximately 5 feet of sediment at core C2-2 is believed to be deposits of the former discharge ditch; these sediments may have been contaminated before entering the basin.

To summarize, the lithologic and chemical data from the cores indicate that the vertical extent of constituents is generally dependent on the thickness of the sediment overlying the Tombigbee River flood plain deposits, rather than on the concentrations in the surficial sediments. The vertical extent is defined in the area where the overlying sediment is interpreted to be the thickest (i.e., in the vicinity of the former wastewater ditch where the sediment entered the basin). Therefore, it is concluded that the existing data adequately characterize the vertical extent of constituents in the basin.

Comment 7: **Provide an assessment (either via sampling and/or modeling) of the environmental affect of chlorobenzene and hexachlorobenzene, since these compounds possess the ability to bioaccumulate.**

Response: The Environmental Evaluation Technical Memorandum and/or the ecological assessment chapter of the baseline risk assessment to be submitted at a later date will include qualitative and quantitative assessments of the ability of the major site constituents of concern to bioaccumulate using existing data and models such as FGETS (Food and Gill Exchange of Toxic Substances). The FGETS model simulates the bioaccumulation of nonmetabolized organic compounds in fish and is one of the main tools used by EPA's Office of Pesticides and Toxic Substances (OPTS).

Comment 8: **Quality control samples for bentonite and sand used in well construction should be collected and analyzed in accordance with standard operating procedures. Analysis of this samples will help determine if these materials are a source of the contamination.**

Additional samples should be collected any time a new batch or lot number of material is used.

Response: Olin does not understand the applicability of this comment to the work that is outlined in the SAP since no well installation is planned.

SPECIFIC COMMENTS

Comment 1: **Section 1.0, Page 1, Paragraph 1. The word "Plan" should be included in the sentence describing the subject document, the "Sampling and Analysis (SAP)..."**

Response: This comment will be incorporated into the document.

Comment 2: **Section 1.0, Page 1, Last Paragraph. The language in this paragraph is unclear. Paragraph could be interpreted to read "Olin monitors and reports on numerous facilities, outside of Olin/McIntosh Plant...." Please clarify.**

Response: The statement will be changed to "The Olin McIntosh plant currently monitors and reports on numerous facilities within the plant that are permitted through the U. S. Environmental Protection Agency (EPA) and the Alabama Department of Environmental Management (ADEM)."

Comment 3: **Section 1.0, Page 1, Paragraph 3. The text states that the Pentachloronitrobenzene (PCNB) Plant was constructed on "an adjacent portion of the site." The actual PCNB Plant area, as shown in Figure 2, is located in the south-central portion of the site, as defined by the indicated property boundary. If the site boundary was expanded to include the PCNB plant area, then this should be stated in the text.**

Response: The text will be changed to indicate that the PCNB plant was constructed on Olin property.

Comment 4: **Section 1.0, Page 1, Paragraph 3. No history of the Mercury Cell Plant is given in the introduction, although the text states that the Mercury Cell Plant was shut down in late 1982. Please include in the introduction the date of construction of the Mercury Cell Plant and any pertinent information about its operation.**

Response: The first sentence in the referenced paragraph will be edited to read, "Olin operated a mercury cell chlorine-caustic soda plant (constructed in 1951) on a portion of the site from 1952 through December 1982."

Comment 5: Section 1.0, Page 2, Paragraph 1. **It is unclear which plant areas are permitted under RCRA regulations (SWMUs, injection wells, and neutralization and percolation field). From the text, it appears that only the corrective action program (CAP) and treatment program is currently permitted under RCRA regulations. The SAP should clarify this point.**

Response: The text will be modified to state the following: "The RCRA post-closure permit includes groundwater protection for the weak brine pond, the stormwater pond and the brine filter backwash pond. The post-closure permit also requires corrective action for releases of Appendix VIII constituents from any SWMUs at the facility. There are no active RCRA units at the facility."

Comment 6: Section 1.1, Page 3. **The narrative on work conducted to date should also include all work conducted after July 17, 1991, including field activities.**

Response: A paragraph will be added to provide a general description of the work that has been completed to date.

Comment 7: Section 1.2, Page 4, Paragraph 2. **The fourth sentence of the text refers to 40 CFR 270.1(c). This reference should be revised to 40 CFR 271.1(c).**

Response: The reference will be corrected.

Comment 8: Section 2.1.1, Page 7, Footnote. **Collect samples at the visually stained/unstained interface for confirmation.**

Response: The RFA report recommended confirmatory sampling for the used oil tank and unloading area and the hydrazine wastewater unloading area. As discussed in the footnote, these recommendations were based on stains on the concrete, other surfaces and adjacent ground that were observed during the visual site inspection. The affected areas around these two SWMUs are minimal. Therefore, Olin proposed in the February 19, 1992 meeting with EPA to address the areas by removing the visibly stained soils and cleaning the stained surfaces. The basis for Olin's proposal was that the resources used for sampling and analysis would be better utilized to remove and clean the minor stained areas. EPA appeared receptive to this approach. EPA now requests confirmatory sampling, presumably after the removal and cleaning activities. Olin believes that the potential hazards associated with the stained soils and surfaces are minimal and that removal and cleaning accompanied by confirmation sampling is not warranted. Olin requests that EPA reconsider their position and allow Olin to address these minor areas by removing the affected soil, cleaning the affected surfaces, and confirming clean-up by visual observation (which is the basis of the RFA concern).

Comment 9: **Section 2.1.1, Page 8, Paragraph 2. A better indication of the types of "general plant debris" disposed of in the Old Plant (CPC) Landfill during the years 1972 to 1977 should be included to determine whether the landfill is a continuing source of organic contamination.**

Response: The text of the SAP will be amended to describe the waste streams placed into the CPC landfill.

Comment 10: **Section 2.1.1, Page 8, Paragraph 2. The text should indicate whether the neutralized wastewater, which was discharged to the Old Plant (CPC) Landfill, was allowed to percolate into the ground or flowed into surrounding areas. If the water flowed beyond the Old Plant (CPC) Landfill, then the final destination of the wastewater should be given. In addition, the text should indicate the date the Old Plant (CPC) Landfill was closed under Alabama Department of Environmental Management (ADEM) regulations.**

Response: The neutralized wastewater flowed from the ponds, which eventually became the CPC Landfill, via an overflow ditch. The flow was directed by the overflow ditch into the main plant wastewater ditch. This is the same main wastewater ditch used today. For the time of operation of the acid neutralization ponds, the main wastewater ditch flowed eastward to and through the basin, then to the Tombigbee River. The contents of the acid neutralization ponds did not flow into surrounding areas. The design of the ponds did not include percolation as an intentional disposal method, but the ponds were built into the natural surficial clay, which was compacted in place. Other than this compacted clay, there was no constructed liner.

Comment 11: **Section 2.1.1, Page 8, Paragraph 3. The text should be revised to correct the code citation from 40 CFR 265 to 40 CFR 264.**

Response: The sentence will be changed to read, "There are two former lime ponds, the east and west ponds, which were not regulated under 40 CFR 264 or 40 CFR 265."

Comment 12: **Section 2.1.1, Page 9. Identify the source of mercury contamination and substantiate the claim provided in the first sentence.**

Response: The text will be changed to the following: "The weak brine pond, in which mercury-containing brine was handled, is the suspected source of mercury to the groundwater in the area. Based on the pre-corrective action potentiometric surface, the wells situated around the lime ponds were located hydraulically downgradient of the weak brine pond."

Comment 13: **Section 2.1.1, Page 9. The discussion of the Sanitary Landfills includes information on the possibility that hexachlorobenzene (HCB) and mercury sludges were disposed of in the Sanitary Landfills. The text states that it is more likely that these types of wastes were disposed of in the Old Plant (CPC) Landfill, but the previous discussion on the Old Plant (CPC) Landfill indicates that only "general plant debris" was disposed of there. The text should include the possibility that HCB and mercury sludges were disposed of in the Sanitary Landfills. In the appropriate section, this document should**

include a complete description of the waste types potentially disposed of in each source.

Response: Apparently, Olin's meaning in the original text of the SAP was unclear. Olin meant that hexachlorobenzene- or mercury-containing waste was never disposed of in the sanitary landfills. The "possibility" arises only as the result of an EPA contractor report, with no confirmation and documentation to back it up. Olin believes the contractor report is based on the conjecture that such waste must have been placed in the sanitary landfills since all wastes were managed on-site. However, this is incorrect based on Olin records. Notwithstanding this, Olin has proposed sampling to investigate whether there is hexachlorobenzene or mercury within the sanitary landfills. Olin will also clarify (see response to comment 9) what wastes went into the CPC landfill.

Comment 14: **Section 2.1.1, Pages 9-12. The locations of the Used Oil Tank and Unloading Area, Hydrazine Wastewater Unloading Area, Old Plant (CPC) Landfill Drainage Ditch, and Well Sand Residue Area discussed in this section should be shown on Figure 2, Facility Layout Map, and included by reference in the respective sections of 2.1.1 that describe each area.**

Response: These SWMUs/AOCs will be added to Figure 2, and Figure 2 will be referenced in the appropriate sections.

Comment 15: **Section 2.1.1, Page 11, Paragraph 0, Sentence 1. The text discusses calculated "relative response" values without explaining the basis for determining the value. The method for calculating "relative response" values should be described, so that the reader can understand the significance of the value.**

Response: A description of the relative response value will be added to the text.

Comment 16: Section 2.1.1, Page 11, Paragraph 1, Sentences 4 and 5. **Provide a review of site aerial photographs in the SAP. This will allow for proper determination as to the adequacy of sampling locations for the former drainage ditch to the Old CPC Plant landfill.**

Response: A general review of the applicable aerial photographs will be included in this paragraph of the Phase III SAP. This review will indicate the photograph date and the approximate scale of the photographs that show the drainage ditch when it was active. However, the detailed review to select the location of the sampling points needs to be done in the field with proper measurement from known landmarks to interpret the photographs.

Comment 17: Section 2.1.1, Page 11, Paragraph 2. **In the discussion of the Mercury Cell Plant, the document should include the regulations under which the area was closed and capped.**

Response: The text will be modified to indicate that the decommissioning of the mercury cell plant, which was a process area, was not subject to regulations of ADEM or EPA.

Comment 18: Section 2.1.1, Page 12, Paragraph 1. **The discussion on the Well Sand Residue Area should include the date Olin began depositing the sand residues in the brine well cavities.**

Response: Olin never deposited well sands in the brine well cavities. As described in the SAP and other RI/FS documents, the well sands, which were the natural insolubles in the salt, were removed from the cavities from 1951 until 1968. After 1968, the sands were simply not removed from the cavities.

Comment 19: Section 2.1.1, Page 12, Paragraph 2. **The discussion on the Strong Brine Pond, should include the date of closure and the regulations under which the area was closed.**

Response: The text will be modified to indicate that the strong brine pond was removed in 1985 and that the removal of this process unit was not subject to regulations of ADEM or EPA. Even though the strong brine pond is a process unit, it was closed in conjunction with the weak brine pond (a RCRA unit). The scope of work for the weak brine pond closure, which was reviewed by EPA and ADEM, also included the strong brine pond closure procedures.

Comment 20: **Section 2.1.2, Page 16, Paragraph 2. The criteria for evidence of release cited in the RFA for the Stormwater Pond and the Brine Filter Backwash Pond should be included in the text.**

Response: The following sentence will be added to the last paragraph in Section 2.1.2: "The mercury concentrations reported in monitor wells in the vicinity of the stormwater pond and the brine filter backwash pond are the data reported in the RFA to indicate that releases have occurred from these two units."

Comment 21: **Section 2.2.1, Page 17, Paragraph 3, last sentence. The acronym "PCHB" should be revised to read "PCNB."**

Response: This correction will be made.

Comment 22: **Section 2.2.1, Page 18, Paragraph 2. The text should state the type of water sample (that is, surface water or ground water) in which mercury was detected at levels at or below drinking water standards.**

Response: The types of samples that were collected, (sediment and basin water) were listed in the first paragraph of Section 2.2.1 of the SAP. To clarify, the phrase in Section 2.2.1, Page 18, Paragraph 2 will be modified to read: "Mercury concentrations in the basin surface water samples were reported at or below the...."

Comment 23: **Section 2.2.2, Page 18, Paragraph 1. The date the OU-2 site characterization activities were initiated (that is, the date the remedial investigation began) should be included in the text.**

Response: The dates of the site characterization activities will be added to the text.

Comment 24: **Section 2.2.2.1, Page 21, Paragraph 1. The text indicates that core C2 was collected to a total depth of 5 feet, where a mercury concentration of 33.2 mg/kg was detected; however, Figure 9 indicates that core C2 was sampled to a total depth of 13.5 feet. Figure 9 indicates that the Phase I and Phase II C2 core samples have been combined, but this presentation is unclear in the text. The document should be revised to indicate clearly Phase I and Phase II sampling results.**

Response: The following will be added to this paragraph: "During the Phase II sampling described in Section 2.2.2.2, a second core was completed at this location to a depth of 13.5 feet and identified as core C2-2."

Figure 9 will be modified to show that C2 and C2-2 were completed at the same location and that the log is based on both cores.

Comment 25: **Section 2.2.2.1, Page 21, Paragraph 2. The presentation of contaminants and concentrations in this paragraph is confusing. The paragraph should reference the tables where the sample results are tabulated.**

Response: A table summarizing the results will be added to the document and this table will be referenced in Section 2.2.2.1.

Comment 26: **Section 2.2.2.1, Page 21, Paragraph 2. The text in the second sentence states that only core C3 contained hexachlorobenzene. However, core C2 is reported to contain a screening concentration of 1.7 µg/kg hexachlorobenzene, according to Figure 9 and Table 3. Report concentration in the text.**

Response: The text will be modified to indicate that the surficial sample at core location C-2 showed hexachlorobenzene at 1.7 mg/kg in the screening analyses.

Comment 27: Section 2.2.2.1, Page 21, Paragraph 4. **The significance of comparison between concentrations of dichlorobenzene and hexachlorobenzene is unclear. Provide language that clearly discusses the relevance intended in this statement.**

Response: There is no paragraph 4 on page 21. It appears that the comment refers to Paragraph 2, Page 21.

The purpose of the statement is to support the use of hexachlorobenzene as an organic indicator parameter. The following summary statement will be added to the paragraph: "Based on these data, the distribution of the TCL chlorinated benzenes can be adequately characterized by the distribution of hexachlorobenzene."

Comment 28: Section 2.2.2.1, Page 22, Paragraph 4. **Although Olin claims never to have handled pesticides at the McIntosh facility, the presence of pesticides in the basin is evident, as sampling results indicate. Pesticides should not be excluded as a contaminant of concern. Determine the source of this pesticide contamination.**

Response: Olin has not excluded pesticides as a contaminant of concern. Pesticides are being assessed in the baseline risk assessment. Olin believes that sufficient data were produced from the Phase I and II samplings to assess the risk from pesticides. Olin does wish to keep the source of the pesticides in perspective. It is unnecessary to "determine" the source of the pesticides. Olin attributes the source of the pesticides to the Ciba-Geigy facility, which is located on adjacent property directly to the north of the Olin facility. Currently, Ciba-Geigy is conducting an investigation under CERCLA of chlorinated pesticides in the floodplain of both their property and the basin.

Comment 29: Section 2.2.2.1, Page 24, Paragraph 2. **The text discusses HCB contamination in the wastewater drainage ditches but does not address the need for additional sampling. Define the horizontal extent of contamination in the vicinity of sediment samples OD01, DD04, and DD03, which had detected HCB concentrations of 85.7, 55.2, and 970.0 mg/kg, respectively. The sample locations are in a wetland area that is prone to flooding by the Tombigbee River; such flooding might have caused dispersal of sediment contamination into the adjoining wetlands.**

Response: The text referred to on page 24 is describing the previous results. Text on pages 45 and 47, in conjunction with Figure 16 referenced on page 47, describe the planned sampling which we believe is already responsive to this comment. To clarify, additional sampling is planned in the flood plain area in the vicinity of OD01, DD04 and DD03; the locations of these samples were shown in Figure 16 of the SAP. Figure 16 further showed that Olin is planning extensive sampling of the wetlands area beyond the boundaries of the basin.

Comment 30: Section 2.2.2.1, Page 23, Paragraph 2. **The purpose of the remedial investigation is to identify all contaminants at the site, as well as the vertical and horizontal extent of contamination. Therefore, the holding time and contaminant attribution are not acceptable criteria for the exclusion of HCB, 4,4-DDD, 4,4-DDE, and 4,4-DDT as indicator contaminants.**

Response: HCB was included as an organic indicator parameter. The sentence referred to by this comment gave the rationale for not including chlorobenzene, 4,4-DDT, 4,4-DDE, and 4,4-DDD.

Olin believes that the CLP analyses (TCL volatile organics, TCL semivolatile organics, TCL pesticides/PCBs, and selected TAL constituents) that have been conducted on the OU-2 sediments adequately identify the contaminants at the site.

The discussion presented on Page 23, Paragraph 2 refers to the selection of the organic indicator parameters for the laboratory screening analyses. The laboratory screening analyses were conducted on split samples that were collected at the same time as the Phase I CLP analyses (August 1991). The samples for the screening analyses were stored on-site, refrigerated and protected from light for up to 60 days while waiting on the results of the CLP analyses (as stated in the sampling and analysis plan of the amended work plan submitted to EPA on May 25, 1992). Based on the distribution and the occurrence of analytes reported in the CLP results, constituents were selected to be analysed by the laboratory screening method. The screening analyses were then used in the evaluation of the horizontal extent of constituents.

The primary reason for not selecting chlorobenzene as an organic indicator parameter for analysis by the screening method was that chlorobenzene was reported at significantly lower concentrations than hexachlorobenzene in the CLP analyses of the surficial grab samples. These CLP analyses were all performed within the requisite holding times. Hexachlorobenzene has a lower solubility and lower vapor pressure than chlorobenzene; hexachlorobenzene would be expected to be more persistent in the surficial sediments and therefore a more appropriate indicator of the horizontal extent of constituents than chlorobenzene. In addition to the concentrations reported from the CLP analyses of the sediments, the potential bias caused by the loss of volatiles during the 60-day holding period for the screening analyses was another factor in not selecting chlorobenzene for analysis by the laboratory screening method.

Chlorobenzene analyses were conducted for the Phase II cores collected in November 1991 (as part of the TCL volatile organic analyses) to evaluate the vertical extent of constituents. Chlorobenzene was reported as not detected in the bottom intervals sampled for all of the cores with the exception of OD15. An additional core is planned for the OD15 location and the samples will be analyzed for TCL volatile organics (including chlorobenzene).

Regarding the DDT compounds, Ciba-Geigy is conducting an investigation under CERCLA for these compounds, as discussed in the response to comment No. 28.

Comment 31: Section 2.2.2.1, Pages 24-26. **Region IV Sediment Screening Values for Hazardous Waste Sites should be used in evaluating sediment metal concentrations, in addition to regional background values. The Region IV Sediment Screening Values for Hazardous Waste Sites are based on NOAA's Biological Effects Range Values as identified in the document cited below. The maximum values of antimony, lead and zinc appear to have exceeded these screening values.**

Long, Edward R., and Lee G. Morgan. 1990. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. Office of Oceanography and Marine Assessment, Seattle, Washington.

Response: The Environmental Evaluation Technical Memorandum, which will be submitted at a later date, will include an evaluation of the metal concentrations and the potential impact to the biota. For this evaluation, the sediment concentrations will be compared to the regional background concentrations and values such as the EPA Region IV Sediment Screening Values based on Long and Morgan (1990).

Comment 32: Section 2.2.2.1, Page 24, Paragraph 3. **Values for inorganic compounds discussed in the text are compared to common ranges for each constituent as reported in SW-874 (U. S. EPA, 1983). However, for purposes of accurate comparisons, background and control samples also should be collected within the study area to further evaluate the significance of the detected ranges for each Target Analyte List (TAL) metal.**

Response: In correspondence from Mr. Jim Brown of Olin to Ms. Cheryl Smith of EPA, (August 1991) it was explained that the sediment background sample was to be designated from one of the northernmost samples in the basin. Based on the data from the grab samples, none of the CLP samples along this transect appear to be background with respect to mercury (see Figure 8 of the April 2, 1992 SAP). Therefore, using any of these samples for background with respect to the other inorganic analytes did not appear to be appropriate. The concentrations of the inorganic analytes (other than mercury) did not have any apparent spatial trends and the reported concentrations may be due to natural variations in the sediment and analytical variability. Therefore, comparisons were made to common ranges found in soils and sediments. It should be noted that the potential hazards associated with the reported concentrations of these inorganic analytes (whether due to natural or contaminant conditions) are being evaluated as part of the baseline risk assessment.

Olin proposes to collect a background sample for the selected list of TAL constituents during the Phase III sampling activities. Olin proposes to obtain the background sample beyond the boundaries of the Olin facility in an area of similar type sediments and geographical setting. The location of this sample has not yet been determined. Olin will notify EPA of the proposed background sample location at least 2 weeks prior to sample collection.

Comment 33: **Section 2.2.2.2, Figure 9. Core C2-2 is not shown in Figure 9. Also, the vertical scale does not correspond with the core depths shown.**

Response: These comments will be incorporated into Figure 9.

Comment 34: **Section 2.2.2.2, Page 27. The document fails to discuss whether the vertical extent of contamination can be determined. The vertical extent of contamination in the wastewater ditch, specifically at sample location OD15, has not yet been determined from Phase II core data. Collect an adjacent core in the wastewater ditch at the depth of OD15.**

Response: An additional core was included in the April 2, 1992 SAP at the location of OD15. After discussion of the OD15 results on Page 29, the text of the SAP stated, "Therefore, additional sampling and analysis to a deeper depth at OD15 is required." The following sentence will be added at the end of this paragraph: "The details of the planned additional sampling are outlined in Section 4.2."

The EPA contractor observed a 2- to 3-inch layer of an unidentified white material in the 3- to 4-foot interval of core OD15 during oversight of Phase II sampling activities. Provide an explanation of the identity of this material.

Response: The 2- to 3-inch layer of white material has been identified as lime, which was formerly discharged through the wastewater ditch. The Preliminary Site Characterization Summary (PSCS), which was submitted to EPA on April 16, 1992, characterizes this as a lime layer (page 68). A photograph of the core showing the white layer is presented in the PSCS (Appendix C).

Comment 35: **Section 2.2.2.2, Page 28, Paragraph 2, last two sentences. The text should state the reason the surficial sample (0- to 1-foot interval) of core OD15 was not analyzed for mercury. If the reasoning is based on the Phase I results, those results should be stated.**

Response: The referenced paragraph in the text will be modified as follows: "No mercury analysis was performed on the core OD15 surficial sample (0- to 1-foot) since a surface grab from this location had been analyzed during Phase I. The Phase I analysis indicated a mercury concentration of 4.9 mg/kg."

Comment 36: **Section 2.2.2.2, Page 28, Paragraph 3. The text refers to core sample CE2; however, no core sample CE2 appears in the appropriate tables or in Figure 9. Based on results presented in Table 4, core CE-2 is shown as core E-2. Please correct this discrepancy.**

Response: These discrepancies will be corrected.

Comment 37: Section 2.2.2.2, Page 29, Paragraph 1, last sentence. **The text states that hard clay was encountered at the 2- to 3-foot interval of core OD25. However, Figure 9 indicates that this interval is composed of sand. Please resolve this discrepancy.**

Response: The text states that hard clay was encountered at the bottom of the boring. However, none of the clay sample was retained in the core. The core was terminated at approximately 3 feet due to "refusal" and this depth of "refusal" was interpreted to be the sand/clay interface. It should be noted that this core was completed in the plant area at the beginning of the outfall ditch, and the ditch sediment material was not expected to be very thick. The text will be modified to indicate that the interpretation of clay at the bottom of the boring was based on "refusal" of the coring equipment. A note will be added to Figure 9 indicating that the base of the boring is interpreted as clay, based on refusal of the coring equipment.

Comment 38: Section 3.1, Page 30, Bullet 2. **Change 40 CFR 265 at the end of the sentence to 40 CFR 264.**

Response: This reference will be changed.

Comment 39: Section 3.1, Page 30, Bullet 2. **The text indicates that additional sampling is needed to assess whether the SWMUs that were clean-closed under 40 CFR 265 satisfy the requirements of clean closure under 40 CFR 264. The text should include the clean closure criteria as required by 40 CFR 264.**

Response: In response to this comment, the following will be added to the text: "According to the EPA memorandum (USEPA, 1989) clean closure under 40 CFR Part 264 requires that the owner or operator remove all waste and liners and all leachate and materials contaminated with the waste or leachate (including groundwater) that pose a substantial present or potential threat to human health or the environment."

Comment 40: Section 3.1.1, Page 30. **The text states that the sampling objective at the Old Plant (CPC) Landfill is to determine whether the landfill is a continuing source of groundwater contamination. Furthermore, the assessment will be performed by characterizing soil and waste samples. However, groundwater sampling is not proposed as a part of the assessment. In order to determine whether the landfill is a continuing source of groundwater contamination, a complete assessment should include groundwater sampling and analysis. To properly characterize the source, provide a sampling strategy for the immediate vicinity of the landfill.**

Response: Olin does not propose to do an assessment of the old plant (CPC) landfill without evaluating the groundwater. Rather, an evaluation of the groundwater has been conducted and is the basis for scoping the additional investigation. Olin currently samples 37 monitor wells and corrective action wells on a quarterly basis as part of the ongoing RCRA corrective action and compliance monitoring programs. Two of these monitor wells (MP-14 and MP-15) are situated directly downgradient of the old plant (CPC) landfill and were installed for the purpose of downgradient monitoring of this unit. Three other monitor wells (E-4, E-5, and E-6) are located in the vicinity of the former landfill (within about 200 feet). The quarterly samples are analyzed for a site-specific list of constituents that includes the site-specific analytes for the clean closure equivalency (Table 14 of the SAP), with the exception of hexachlorobenzene and lead. Results of the quarterly analyses were evaluated to assess whether there are any significant, continuous sources at the facility. This evaluation was submitted to EPA in a Source Evaluation Technical Memorandum (SETM) on November 11, 1991.

The groundwater data that are presented in the SETM indicate that the old plant (CPC) landfill may be a continuing source of groundwater contamination. This interpretation is based on generally increasing or non-diminishing trends in concentrations in the downgradient monitor wells and other monitor wells in the vicinity of the former landfill. Examination of long-term trends in the downgradient concentrations is the best approach for evaluating the groundwater data for the McIntosh facility. The source of constituents detected in one or two samplings of individual monitor wells is difficult to

interpret due to the permeability of the Alluvial Aquifer and the horizontal gradients induced by pumping the corrective action wells.

The additional sampling that is planned focuses on the waste and soil in the old plant (CPC) landfill area and whether these media are continuing sources of groundwater contamination, as indicated by the quarterly groundwater sampling data. The physical and chemical waste properties that relate to constituent migration (e.g., presence or absence of a non-aqueous phase liquid, solubility, log-octanol water partition coefficient) will be used to assess the mobility of the waste constituents. An evaluation of the former landfill as a potential source will then be made using the quarterly groundwater sampling data and the data obtained from the waste and soil sampling. The waste and soil sampling will also provide data to evaluate feasibility study options.

Comment 41: Section 3.1.2, Page 31. **The sampling objective for the Lime Ponds is to determine whether the ponds are a source of mercury contamination of groundwater. The text states that objective will be accomplished by determining the mercury content of the buried lime waste and assessing the leachability of any detected mercury. To perform a complete assessment of the Lime Ponds, provide a sampling strategy for additional boring locations and groundwater sampling of the immediate vicinity of the ponds.**

Response: To do what the comment is asking presumes that mercury is leaching from the lime waste. The RFA recommends confirmatory sampling, not a complete assessment. In comments provided by Olin on the draft RFA (A. T. Kearney, 1991), Olin explained why it is unlikely that the lime ponds contain any mercury (Page 1, Attachment 1 to Brown, December 1991). Further, on page 2 of the cover letter to Brown, (December 1991), Olin discussed a major issue: sampling of SWMUs where wells are downgradient of several SWMUs. For example, the wells in the vicinity of the lime ponds indicate mercury contamination. These wells are also downgradient of the weak brine pond, which Olin believes was the source of the mercury. Obviously, if the lime ponds do not contain mercury, they could not be a source. This is the basis of the sampling outlined in the SAP. Olin believes that the planned sampling approach is sufficient to assess whether the ponds could leach mercury to the groundwater. If the

data indicate that the ponds could leach mercury to the groundwater, the additional investigation as suggested by the comment may be appropriate.

Comment 42: Section 3.1.3, Page 31. **Information in Section 2.0 indicates there are two sanitary landfills; however, this information is not indicated in the heading of Section 3.1.3.**

Response: The Section 3.3.1. heading will be changed to indicate Sanitary Landfills.

Also, the sampling objective is to establish whether contamination is present in the sanitary landfills. Based on the results of sampling activities, a conclusion cannot be drawn to determine whether or not the landfill was used for the disposal of wastes containing HCB or mercury. At least three vertical composites are required.

Response: The SAP will be changed to indicate that three vertical composites will be completed at the sanitary landfills.

Comment 43: Section 3.1.6, Page 32. **Provide an assessment of the wind pattern over this area to determine the possible dispersion of mercury to the surficial soils in the vicinity of this unit. Subsequently, prepare a plan for sampling (i.e., grid of the area) to coincide with the possible dispersion pattern.**

Response: Olin requests that EPA provide additional information on the rationale for this comment. The mercury cell plant, to which this comment refers, is a former operating area which has been decommissioned. Decommissioning included removal of all process equipment and covering most of the former plant area with asphalt. Mercury emissions to the air from this area are virtually impossible. The areas around the former plant continue as operating areas for currently active processes. Olin sees no need for any sampling of surficial soils. Such sampling is certainly unnecessary to assess risk to human health and the environment or study the feasibility of any necessary remedies at the site.

Comment 44: Section 3.1.9, Page 33. **List the SWMUs clean-closed under 40 CFR 265. Change 40 CFR 265 on the third line to 40 CFR 264.**

Response: The text will be changed to reflect the correct citation.

Also, the text should include information on the applicable standards to be used for comparison of soils for the clean-closure equivalency demonstrations.

Response: The text does state the applicable standards as provided in the EPA Region IV guidance for clean closure equivalency demonstrations (USEPA, 1991). This guidance indicates that the criteria for determining equivalency is to compare detected concentrations to water quality standards (which would not be applicable for soil samples) and health-based limits based on verified reference dose values and carcinogenic potency factors. Olin would appreciate any additional guidance documents that are available from EPA regarding applicable standards for clean closure equivalency demonstrations.

Comment 45: Section 4.0. **Quantitation limits for analytes in sediments should be at or below the effects range-low (ER-L) values of Long and Morgan (1990). The ER-L for mercury is 0.15 mg/kg (dry weight), 0.001 mg/kg for DDT, and 0.002 mg/kg for DDE and DDD.**

Response: It is inappropriate to define the quantitation limits for the project based on the ER-L values, which are guidelines (Long and Morgan, 1990, page 8). Olin proposes to use the CLP analytical procedures that were used in Phase I and Phase II for the mercury analyses and which EPA uses on Superfund RIs. The Phase I and Phase II mercury quantitation limits using CLP procedures varied from 0.15 mg/kg to 0.25 mg/kg (dry weight) for the samples that were reported below the quantitation limit. The sediments that were sampled were submerged and had high moisture content. The moisture content elevated the dry weight quantitation limits. Olin proposed to use the same procedures for the additional sampling. The quantitation limits again will vary and will be dependent on the moisture content. However, the moisture content should be lower than the previous samples because most of the samples will not be submerged.

In addition to total mercury, sediment samples should be analyzed for acid volatile sulfides (AVS) and simultaneously extracted metals (SEM) and the ratio of SEM/AVS calculated. Organic mercury analyses also should be conducted for sediments. Analyzing for AVS/SEM and organic mercury will provide greater insight into the bioavailability of the mercury within the system. The presence of mercury in fish tissue samples from the Basin indicates that mercury is in a bioavailable form.

Response: Recent studies have indicated that AVS/SEM can be an indicator of the metal-binding capacity of the sediment and thus the bioavailability of certain metal constituents. It is our understanding from a review of the recent literature that no firm conclusions have been made regarding the usefulness of these tests, particularly with regard to mercury. It is not clear at this time what additional information these tests would provide for characterization of the basin ecosystem; mercury was reported in the sediments and also in the fish and therefore the conclusion can be made from the existing data that the mercury is in a bioavailable form. We are continuing to evaluate the AVS/SEM testing procedures to determine whether they may be appropriate for the basin sediments during the Phase III investigation. We would appreciate additional input from EPA regarding the tests and their potential applicability to the Olin McIntosh RI/FS.

It has been Olin's experience that little useful information is gained by analysis of sediments for organic mercury. Commonly, these analyses show organic mercury as not detected, which may be misleading because organic mercury in the sediments (even at concentrations below the detection limit) can be assimilated by the biota.

Analyze all samples for TCL pesticides due to presence of DDT, DDE and DDD.

Response: As described in the responses to comment No's. 28 and 30, Olin does not propose to analyze the sediments for the DDT compounds because: 1) hexachlorobenzene is a positive indicator for organics, 2) sufficient data exist to assess the risk from DDT, DDD, and DDE, and 3) Ciba-Geigy is conducting an investigation of the floodplain that includes analysis for chlorinated pesticides, which they produced.

Comment 46: Section 4.1.1, Page 36. **Provide an approximate total depth from land surface for the proposed soil borings at the Old Plant (CPC) Landfill.**

Response: Page 37 (last paragraph) of the SAP stated, "The soil borings will be advanced to about 10 to 20 feet into the Alluvial Aquifer or until no elevated headspace measurements are recorded. The top of the Alluvial Aquifer is about 15 feet below ground surface in the area." The statement "Therefore, the estimated total depth from land surface for the planned borings is about 25 to 35 feet" will be added to the text.

Comment 47: Section 4.1.1, Page 37. **It should be clearly stated whether the samples collected from the four borings in the Old Plant (CPC) Landfill will be analyzed separately. Provide the total number of samples proposed for this location as well as additional boring locations.**

Response: The last sentence in the first paragraph of Section 4.1.1 will be modified to read: "Four discrete samples will be collected from each soil boring (i.e., a total of 16 samples) and each sample will be analyzed separately for chemical constituents."

Table 6 will be modified to indicate the number of borings for each SWMU and the number of samples to be collected from each boring.

Comment 48: Section 4.1.2, Page 38. **The text does not state the approximate location of each boring to be collected from the two Lime Ponds; however, Figure 15 indicates the borings are to be collected from the centers of the former ponds. The text should include this information.**

Response: The first sentence of Section 4.1.2 will be modified to read, "One soil boring will be completed near the center of each of the two inactive lime ponds. Each boring will extend to the base of the lime waste."

Comment 49: Section 4.1.2, Page 38. **If available, provide the approximate depth to the base of the waste material. Provide proposal for additional sampling locations. In addition, if the base of the waste cannot be determined during drilling operations, give an estimated maximum boring depth to assure that representative samples are collected.**

Response: The text has been modified to indicate that the base of the waste is anticipated to be within the upper 10 feet, which will be the maximum depth of the borings. See response to comment 42 regarding additional borings through the landfill.

Randomly select the location for placement of three borings within this unit.

Response: Three borings will be completed through this unit as discussed in the response to comment 42. The text will indicate that the locations of these borings will be randomly selected.

Comment 50: Section 4.1.4, Page 39. **The text states that 2 composite soil samples will be collected from one boring. Table 6, Summary of Sampling Activities, lists only one composite soil sample to be collected and analyzed. Please clarify.**

Response: Table 6 will be corrected to indicate that two composite samples will be collected.

Comment 51: Section 4.1.4, Page 39. **Provide the proposed locations for the borings. The proposed boring, or a second boring, must be collected as close to the existing wastewater ditch as possible. That area might have been least disturbed by earthmoving activities.**

Response: As discussed on Page 11 of the SAP, there is no surficial evidence of the old plant landfill drainage ditch and due to the extensive earthwork in the area, there may not be any subsurface remnants of the former ditch. Therefore, the sampling may not be successful at locating a discernable ditch. However, because the area has been reworked, the sampling should provide data on the soils from the former ditch contained throughout the subsurface in the reworked area. Given these conditions, Olin believes that one boring, to be located based on the information that is available, will be sufficient. As discussed in the response to comment 16, Olin will provide a preliminary review of the aerial photographs in the SAP, which will indicate the photograph dates and the approximate scale of the photographs that show the former ditch. The detailed review to select the sample location needs to be conducted in the field with proper measurements from known landmarks to interpret the photographs. In response to this comment, the SAP will be revised to indicate that the boring will be located as close to the current wastewater ditch as feasible, an area that may have been least disturbed by earthmoving activities.

Transfer samples collected for volatile organic analyses directly to the sample container. Text must state that these samples will not be composited.

Response: The text will be modified to indicate that the samples for volatile analysis will be placed in the sample container before preparing composite samples.

Comment 52: Section 4.1.5, Page 40, Last Paragraph. **This section refers to monitoring wells MW-6 and MW-7, located in the CPC Plant area. However, Figure 12, which presents CPC Plant area sampling locations, shows monitoring wells MP-6 and MP-7. This discrepancy in the monitoring well numbers should be corrected. Provide analyses parameters for groundwater samples.**

Response: The discrepancies will be corrected. The text will be changed to indicate that the samples will be analyzed for the same parameters as the quarterly RCRA analyses. The list will be provided in the text, as well as a reference to the analytical methods.

Since submittal of the April 2, 1992 SAP, Olin evaluated monitor wells MP-6 and MP-7 to determine whether they are sampleable. This evaluation, which included lowering a bailer down the wells, indicated that a sample could not be obtained from MP-7 due to an obstruction in the well. A sample was obtained from MP-6, and the preliminary results indicated that chloroform is the primary organic constituent. Chloroform is a degradation product from wastes generated during operation of the CPC plant, as was indicated in the amended work plan (May 25, 1991) and several subsequent submittals to EPA. These wastes were disposed of in the old plant (CPC) landfill and are believed to be the source of the chloroform to the groundwater. Both MP-6 and MP-7 are screened near the top of the Alluvial Aquifer, approximately 120 feet apart. Therefore, not being able to collect a sample from MP-7 does not greatly reduce the characterization of groundwater in the area. The SAP will be revised to include the preliminary results from MP-6 and will indicate that Olin will continue to sample MP-6 on a quarterly basis. The Phase III SAP will further indicate that the MP-6 sample results will be included in the draft and final RI reports with the other Phase III data.

Comment 53: Section 4.1.6, Page 41, Paragraph 1. **The text states that soil borings in the vicinity of the former Mercury Cell Plant area will be advanced to a depth of 4 feet below the asphalt cover. However, according to the description of the Mercury Cell Plant given in section 2.1.1 on page 11, there are concrete pads and foundation under the asphalt cover. Therefore, the text should state that soil borings will be advanced 4 feet below the concrete pads and foundation to obtain samples.**

Response: The text will be modified to read as follows: "The borings will be advanced to a depth of approximately 4 feet below the asphalt cover. If the borings encounter any concrete pads or foundations, the borings will be advanced approximately 4 feet below these pads/foundations."

Analyze samples for total mercury and TCLP mercury.

Response: The SAP will be amended to analyze for total mercury, as well as TCLP mercury as proposed. However, Olin believes total mercury does not contribute much to the understanding of this area. The asphalt pad prevents direct contact. It also retards rainwater infiltration. Infiltration can occur through the matrix of the asphalt and any seams and joints in the asphalt. Mercury that has already reached the water table will be intercepted by the wells of the Corrective Action Program under the RCRA Post-Closure Operating Permit. So the only concern is the potential to mobilize mercury by infiltration, which can be assessed by the TCLP. (In fact, the TCLP will likely overestimate the potential, because the leaching medium is more aggressive than infiltrating rainwater would be).

Comment 54: **Section 4.1.7, Page 41. This section should include the method of sample collection for the Well Sand Residues or should make reference to Section 6.3.1, where this information is cited.**

Response: The reference to Section 6.3.1 will be added to Section 4.1.7.

Analyze samples for total mercury and TCLP mercury.

Response: The SAP already included analysis for total and TCLP mercury.

Comment 55: **Section 4.1.9, Page 42. The text states that the following four SWMUs will be sampled to meet the clean-closure equivalency requirements: the Stormwater Pond, the Brine Filter Backwash Pond, the Pollution Abatement (pH) Pond, and the Mercury Waste Pile Storage Pad. However, Section 1.2, page 4 states that five clean-closed SWMUs are subject to clean-closure equivalency demonstrations under 40 CFR 271.1(c). This discrepancy should be resolved.**

Response: Four SWMUs are subject to the clean closure requirements. The discrepancy will be corrected in Section 1.2.

Comment 56: Section 4.1.9, Page 42. **It should be made clear why the four SWMUs listed under this section were selected, out of nine SWMUs clean closed, for clean-closure equivalency demonstrations.**

Response: The following will be added to the text: "The clean closure equivalency demonstrations are being conducted to satisfy the requirements of 40 CFR 270.1(c). Under these requirements, owners or operators of surface impoundments, landfills, land treatment units and waste piles that received waste after July 26, 1983 or certified closure according to 40 CFR 265.115 after January 26, 1982 must either obtain a post-closure permit for those units or demonstrate that 40 CFR Part 264 clean closure standards were met. From 1984 to 1986, nine SWMUs were clean-closed at the Olin McIntosh facility in compliance with 40 CFR 265. Four of the clean-closed SWMUs are subject to 40 CFR 270.1(c) because they are either surface impoundments or waste piles. These include the three surface impoundments (the stormwater pond, the brine filter backwash pond, and the pollution abatement (pH) pond) and one waste pile (the mercury waste pile storage pad). The other five clean-closed SWMUs are either drum storage areas (mercury drum storage pad, chromium drum storage pad and the hazardous waste drum/flammable storage pad), storage buildings (hexachloro-benzene/PCB storage building) or treatment tanks (TCAN hydrolyzer) and are not subject to the requirements."

Comment 57: Section 4.1.9, Page 43, Paragraph 1. **Add the following compounds to the proposed list of analytical parameters since one or more of the collected samples exceeded the Safe Drinking Water Act Maximum Contaminant Level (MCL): , Cadmium, Nickel, Selenium, Dibromochloropropane, methylene chloride and di-n-butyl phthalate.**

Response: In response to this comment, cadmium and nickel will be added to the site-specific list.

Methylene chloride and di-n-butyl phthalate are common laboratory or field contaminants in environmental sample analyses. The results reported in Table 5 are within a concentration range commonly reported as laboratory or field contaminants; therefore, these are not considered site-specific constituents.

Selenium was reported above the MCL in one sample. However, subsequent analysis was conducted using Method 7741 to remove matrix interferences from chloride. The results of this reanalysis were below the MCL. Therefore, selenium is not considered a site-specific constituent.

Dibromochloropropane was reported in only one of the Appendix VIII analyses from an interior monitor well at a concentration of 23.3 ug/l and is not considered a site-specific constituent.

Comment 58: Section 4.1.9, Page 44. **The text should cite the regulation where the Appendix IX analysis data can be obtained.**

Response: The regulation citation will be added to the text.

Comment 59: Section 4.1.9, Page 44, last paragraph. **It is understood that sampling directly in the Stormwater Pond, the Brine Filter Backwash Pond, and the Pollution Abatement (pH) Pond could risk the integrity of the pond liners; however, it is uncertain whether a representative sample can be obtained from one sampling location at the base of the pond dikes. Provide proposal for additional sampling locations.**

Response: The planned sampling is for two borings to be completed for each pond, one to the north and one to the south of each of the three ponds. These soil borings will be located at the base of the dikes directly adjacent to the ponds. The three impoundments are situated adjacent to one another, and the pH pond and the stormwater pond share a common north-south dike. The planned sampling locations were selected as the best locations to detect releases from individual SWMUs without sampling directly through the liners. The purpose of the sampling is to detect any releases and not to characterize the nature and extent of a release if detected. Therefore, Olin believes that additional boring locations are not required.

Because it is not possible to sample directly beneath the three ponds mentioned in the text, sampling activities to be conducted around the periphery of the three ponds should include a soil sample collected from the saturated zone at the top of the surficial aquifer to appropriately characterize the potential for migration of contaminants to groundwater. The sample boreholes used to collected the soil sample 2 feet below the base elevation of each pond should be advanced to the saturation depth.

Response: There are approximately 15 monitor wells in the immediate vicinity of these three impoundments; eight of these wells are sampled quarterly as part of Olin's RCRA groundwater monitoring programs. The historical depth to water in these wells is about 25 to 37 feet below the top of casing. It would be difficult to interpret the source of constituents detected in the soils of the saturated zone at this depth. The basis for the sampling depth that is planned (2 feet below the base of the ponds) is that any releases from the pond would be from material in the pond bottom and would tend to migrate laterally away from the pond as well as downward due to the hydraulic head in the pond. In response to EPA's concern, the document will be changed to indicate that two samples will be collected from each boring, one 2 feet below the base of the ponds and one 7 feet below the base of the ponds.

Comment 60: **Section 4.1.9, Page 44, last paragraph. Because the sampling strategy that the text presents for the three ponds includes sampling outside the actual ponds, an approximate depth to the base of each pond should be stated in the text.**

Response: The approximate depth of each pond will be added to the text.

Comment 61: **Section 4.2, Page 46, Paragraph 2. Because it is difficult to determine from one core sample the vertical extent of contamination for the area, additional core samples must be performed.**

Response: Olin does not propose to determine the vertical extent of contamination with one core. Site characterization has included eight cores at seven different locations. These cores were completed in two phases, with the Phase II core locations determined based on the analytical results from Phase I. With the exception of the core at OD15, the results of the cores have shown a significant reduction in constituent concentrations with depth. The vertical extent of contamination will be determined from the eight cores that have already been completed and the one additional core that is planned.

Comment 62: Section 5.2, Page 48, Figure 16. **Collect sediment and biota samples at the point in the Tombigbee River where the discharge ditch enters and provides results from samples DD02-04 collected during a previous sampling effort. This data is missing from the SAP.**

Response: A sediment grab sample will be added to the SAP at the point in the Tombigbee River where the discharge ditch enters. The decision to collect a biota sample should occur after EPA has reviewed the Preliminary Site Characterization Summary (see response to Comment 6 above).

Regarding the data from DD02-DD04, samples collected from these locations were analyzed for mercury by CLP methods. In addition, screening analyses were conducted for hexachlorobenzene, pentachlorobenzene and pentachloronitrobenzene. The results of the mercury analyses were provided in Figure 8 of the SAP. The results of the hexachlorobenzene analyses were provided in Figure 10 of the SAP. The screening results for pentachlorobenzene and pentachloronitrobenzene will be added to Appendix A of the Phase III SAP.

Change grid sampling locations in area of small ponds to the north of the basin. More sampling locations are needed in this area.

The document will be changed to show a finer grid across the two small ponds to the north of the basin.

Comment 63: Section 6.2, Page 50, Paragraph 1, Sentence 1. **The section of the sentence "will be also be," should be changed to "also will be."**

Response: The referenced sentence will be changed.

Comment 64: Section 6.2, Page 50, Bullet 1. **The text states that all drilling equipment that comes in contact with soils within each borehole, but not in direct contact with soil samples, will undergo a one step decontamination process (steam clean or hand wash with a brush and Alconox detergent). However, this process is not in agreement with U. S. EPA's Standard Operating Procedures and Quality Assurance Manual (SOPQAM) for EPA Region IV (U. S. EPA, February 1991). Section E.9 of the manual recommends a seven-step decontamination process for all tools that are inserted into drilling boreholes. The seven-step decontamination process must be specified and followed.**

Response: The decontamination procedure that is outlined in the SOPQAM is not appropriate for all the equipment that will be utilized in the drilling activities planned for the McIntosh site. The seven-step procedure is to remove very low concentrations of constituents and is applicable when there is potential to transmit these low concentrations to the samples (i.e., for equipment that comes in direct contact with the samples). Equipment such as the augers and the drill stem does not come in direct contact with the samples. Any transfer of contaminants to the samples from this equipment could only occur through the water in the borehole, which is an unlikely scenario (at detectable concentrations), considering that all downhole equipment will be thoroughly decontaminated using soap and a high-pressure steam cleaner. Additional decontamination of augers and drill stem is not necessary. To follow the seven-step procedures would require rinsing the augers and/or drill stem (inside and out) with pesticide-grade isopropanol as one stage of decontamination. The additional time associated with decontamination and the waste isopropanol that is generated are undesireable consequences.

While the seven-step procedure is not planned for the augers and other drilling equipment that does not come in direct contact with the samples, a thorough decontamination of this equipment will be conducted between boring locations (and after setting the surface casing for individual boring locations). More detail regarding the decontamination procedures will be added to the referenced bullet, as follows:

- The equipment that comes in contact with soil but not in direct contact with samples (hollow-stem augers, drill rods, etc.) will be set on saw horses (covered with plastic) within the decontamination area and cleaned (inside and out) using the following procedure:

  - Washing with a brush and a nonphosphatic detergent to remove any loose material.

  - Thoroughly washing with a steam cleaner and/or high-pressure hot water washer that is capable of generating a pressure of at least 2500 psi and producing hot water and/or steam (200° F plus). The steam-cleaner/pressure washer will be used to apply a nonphosphatic soap, followed by a hot water rinse.

  - Thoroughly rinsing the equipment with tap water and allowing to air dry.

  To further reduce the potential for cross contamination between the borings, the drilling will be scheduled so that the borings that are suspected to have the greatest contamination will be completed last.

Comment 65: <u>Section 6.2, Page 51</u>. **The EPA SOPQAM recommends the use of hot tap water for cleaning and rinsing stainless steel sampling equipment. In addition, equipment should be allowed to air dry at least 24 hours after the solvent rinse. Please include these steps in the appropriate descriptions of decontamination.**

Comment 68: Section 6.3.1, Page 52, Paragraph 2, Sentence 1. **The use of petroleum jelly and/or lithium grease to lubricate the threads on downhole drilling equipment is not allowed. If the equipment is cleaned (sand blasted, if necessary), the threads should be clean enough to tighten without lubricants. If lubricants are necessary, Crisco® or Teflon® tape can be used. However, prior to use of any questionable materials (compounds not specified in SOPQAM and/or approved Work Plan), provide specifications, etc. to RPM for approval.**

Response: The text will be modified to indicate the following: "Prior approval from the Remedial Project Manager (RPM) will be obtained before using lubricants (other than teflon tape and vegetable-based lubricants) on the threads of the downhole equipment."

Comment 69: Section 6.3.1, Page 52, Paragraph 3. **The use of antifreeze should be avoided; however, if antifreeze is used, the pump and hoses should be thoroughly flushed to avoid contaminating the drilling fluids. To ensure the pump and hoses are flushed thoroughly, a rinse blank should be collected.**

Response: The phrase "completely purged" will be changed to "thoroughly flushed" and the following sentence will be added: "A rinsate blank will be collected from the hoses after flushing."

Comment 70: Section 6.3.1, Page 53, Paragraph 1. **The brand name of the drilling mud to be used for mud rotary drilling should be specified in the text and should also be approved by RPM before field activities begin.**

Response: The brand name of the drilling mud has not been determined at this time. The following statement will be added to the text: "The brand name of the drilling mud will be submitted to the RPM for approval at least 5 days prior to any rotary wash activities."

Response: The comment refers to Section B4 of the SOPQAM, which apparently describes the procedures used by Environmental Compliance Branch Personnel in Branch washrooms, which have hot water for cleaning and rinsing. In addition, there apparently are "clean" storage areas available to allow the equipment to air dry for 24 hours. The equipment that is cleaned using these methods is then brought on-site precleaned. However, Section B8 of the SOPQAM provides field equipment cleaning procedures, which are applicable for large-scale investigations where transporting the equipment precleaned to the field is impractical. The decontamination procedures outlined in the April 2, submittal are based on these field cleaning procedures. It is impractical to have precleaned sampling equipment for the work that will be performed at the site, considering that the stainless-steel hand sampling tools will be used to collect over 25 surface grab sediment samples and the stainless steel Ekman dredge sampling equipment will be used for collecting the submerged sediment samples.

Comment 66: Section 6.2, Page 51, Step #4. **The text states that pesticide- or reagent-grade isopropanol will be used as a solvent rinse. However, the EPA SOPQAM, Section E.9, states that pesticide-grade isopropanol should be used during the decontamination procedure. The SOPQAM must be followed.**

Response: The text will be changed to indicate that pesticide-grade isopropanol will be used.

Comment 67: Section 6.3.1, Page 52. **Analyze an initial sample of the rotary drilling mud for quality control purposes.**

Response: The text will be changed to indicate that an initial sample of the drilling mud will be analyzed and to indicate the parameters for analysis.

Woodward-Clyde Consultants

Comment 71: Section 6.3.2.1, Page 53, Bullets 1 and 2. **Butyrate plastic sleeves should not be used to collect samples. Allowable sample collection materials are glass, stainless steel, and Teflon, respectively.**

Response: The text has been modified to indicate that stainless steel tubes will be used.

Comment 72: Section 6.3.2.1, Page 54, Bullets 1 and 3. **Butyrate plastic sleeves should not be used to collect samples. Allowable sample collection materials are glass, stainless steel, and Teflon, respectively.**

Response: The text will be modified to indicate that stainless steel tubes will be used.

Comment 73: Section 6.3.2.3, Page 56, Paragraph 3. **For a more complete screening of headspace measurement, use both a PID and OVA.**

Response: The text will be modified to indicate that both a PID and an OVA will be used to screen the soil samples.

Comment 74: Section 6.3.2.5, Page 58. **All field instruments must be post-calibrated any time the instruments are shut down (i.e., lunch time or at the end of the day).**

Response: The following will be added to the text: "The instruments will be post-calibrated every time the instruments are shut down."

Comment 75: Section 6.4.2.1, Page 61. **The text does not indicate that samples (except for those volatile organic analyses) will be mixed. All samples must be mixed in accordance with Section 4.2.10 of the EPA SOPQAM.**

Response: A new section (6.4.2.3) will be added. This Section, "Sample Mixing Procedures," will describe the mixing procedures based on the EPA SOPQAM.

Comment 76: Section 6.7, Page 64, Paragraph 1. **The first sentence references Section 4.0 for soil collection procedures. Section 4.0 is titled "Field Activities." Please clarify.**

Response: The appropriate chapters will be referenced in the Phase III SAP.

Comment 77: Section 6.7.1, Page 64. **Clarify the intended use of the five blank columns across the top of the form.**

Response: These columns are to identify the types of analytical tests for each sample.

Comment 78: Section 7.0, Table 13. **The source used to determine the non-Contract Laboratory Program (CLP) analyte reporting limits should be stated in a footnote.**

Response: Footnotes will be added to Table 13 to indicate the source(s) of this information.

The text should explain why hexachlorobenzene and mercury are being analyzed by non-CLP methods. Mercury is among the TAL metals and hexachlorobenzene is among the Target Compound List (TCL) semivolatile compounds.

Response: TCLP is not a CLP procedure, rather it is a procedure under RCRA. It was considered more appropriate to use RCRA methods (SW-846) for mercury analysis of the TCLP extract. Mercury analyses other than TCLP will be by CLP procedures. The justification for using the screening method for HCB (i.e., comparison of the method to CLP) was provided on Page 68 of the April 2, 1992 submittal.

Comment 79: Section 7.1, Page 67, Paragraph 5. **Update SW-846 reference to 1991 revision.**

Response: The 1991 revision to SW-846 had not been promulgated as of June 8, 1992, according to the Office of Solid Waste Methods Information Communication Exchange (phone number 703/821-4789).

Comment 80: **Section 7.1, Page 67, last paragraph. This paragraph states inaccurately that a copy of the hexachlorobenzene screening method is provided in Appendix C. The material provided is not a copy of the method, but a copy of the results of the validation study that was performed on the method. The method description should be included in the document to support the statement in the text.**

Response: A copy of the procedure was attached as the last three pages of Appendix C.

Comment 81: **Section 7.1, Page 68, Paragraph 1. It is unclear why the screening method as well as the CLP method were used. Provide the rationale for using both methods.**

Response: The approved Work Plan for the Phase I activities specifies that selected samples would be analyzed by both methods.

Comment 82: **Section 7.1, Page 69, Paragraph 1. The phrase "the inherent in homogeneity of the samples" should be changed to "the inherent lack of homogeneity of the samples."**

Response: The phrase will be changed in the Phase III SAP.

Comment 83: **Section 7.2, Page 69, Paragraph 3. Update SW-846 reference to 1991 revision.**

Response: The 1991 revision to SW-846 had not been promulgated as of June 8, 1992, according to the Office of Solid Waste Methods Information Communication Exchange (phone number 703/821-4789).

Comment 84: Section 7.4, Page 82, last sentence. **This sentence should read, "The purpose of data validation is to determine whether the data conform to the specifications defined as suitable for the intended project usage" or language to that effect. Please clarify.**

Response: The phrase will be changed to the language suggested by the comment.

Comment 85: Section 7.4, Page 84, last paragraph. **This paragraph identifies the data that are considered non-CLP. Although 1,2,4,5-tetrachlorobenzene was not included, Table 13 indicates that it should be. Please clarify.**

Response: The compound 1,2,4,5-tetrachlorobenzene will be included with the CLP analyses as a Special Analytical Services (SAS) analysis. The method of data review is not the same as for the target compounds. The text will be modified to indicate how the SAS analysis data will be reviewed.

Comment 86: Section 7.1, Tables 16H, 16I, 16K. **According to these tables, analysis for mercury is being done by method 245.1, 245.5, and 7470. The text should explain why analysis for mercury is being done by three different methods.**

Response: Method 245.1 CLP-M is for water samples (e.g., rinsate). Method 245.5 CLP-M is for the soil samples. Method 7470 is for the TCLP extract.

Comment 87: Table 15, Footnote 5. **Update SW-846 reference to 1991 revision.**

Response: The 1991 revision to SW-846 had not been promulgated as of June 8, 1992, according to the Office of Solid Waste Methods Information Communication Exchange (phone number 703/821-4789).

Comment 88: Appendix A. **Provide data for samples DD02-04.**

Response: See response to comment 62.

REFERENCES

Brown, J. C., Letter to Cheryl Walker Smith, U.S. EPA, Sediment Background Sample, August 14, 1991.

Brown, J. C., Letter to James Kutzman, U.S. EPA, Comments on Draft Final RFA Report, December 1, 1991.

Halbouty, Michael, Salt Domes Gulf Region, U.S. and Mexico (Houston: Gulf Publishing Co., second edition, 1979a).

Halbouty, Michael, Salt Domes Gulf Region, U.S. and Mexico (Houston: Gulf Publishing Co., second edition, 1979b).

Kearney, A. T. Inc., RCRA Facility Assessment of Olin Chemicals Corporation McIntosh, Alabama. Submitted to U.S. EPA Region IV, August 19, 1991.

Long, Edward R., and Morgan, Lee G. 1990. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. Office of Oceanography and Marine Assessment, Seattle, Washington.

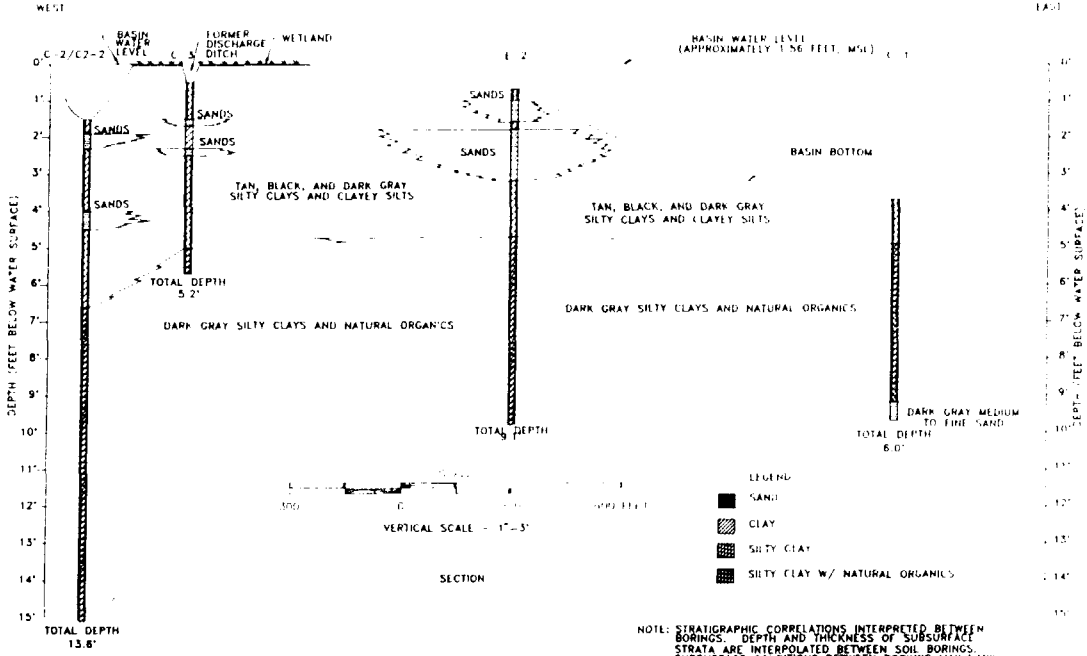
Pearson, Theodore, "Salt Mining in Washington County 1800-1957", 1958.

Thomas, R. L. and Gehle, R. M., "Hydrofrac Gradient in Gulf Coast Salt Domes, Phase 2 Status Report", April 25, 1990.

U.S. EPA, Memorandum from Sylvia Lowrance, Director of Soild Waste, to Regions I-X; Guidance on Demonstrating Equivalence of Part 265 Clean Closure with Part 264 Requirements, May 12, 1989.

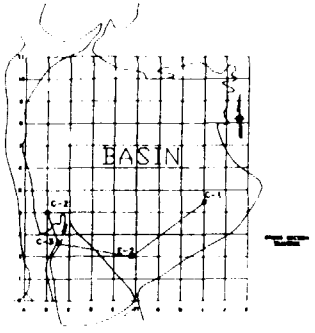
U.S. EPA, Region IV, Guidance for Conducting Clean Closure Equivalency Demonstrations, April 4, 1991.

U.S. Geological Survey; "Availability of Groundwater in washington County, Alabama", Prepared by



NOTE: STRATIGRAPHIC CORRELATIONS INTERPRETED BETWEEN BORINGS. DEPTH AND THICKNESS OF SUBSURFACE STRATA ARE INTERPOLATED BETWEEN SOIL BORINGS. SUBSURFACE CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE DEPICTED. THE SOIL BORING LOGS PRESENT SUBSURFACE CONDITIONS ONLY AT THE LOCATIONS AND DATES INDICATED. WATER LEVELS AND RELATED DATA MAY VARY WITH TIME.

BASIN WATER LEVEL MEASUREMENT TAKEN ON JULY 24, 1991.



PLAN

SCALE
600 0 600 1200 FEET

RI/FS
McINTOSH PLANT SITE

Woodward-Clyde Consultants
Consulting Engineers, Geologists and Environmental Scientists
Baton Rouge, Louisiana

OLIN CHEMICAL CORPORATION
CHARLESTON, TENNESSEE

SCALE: NOTED
MADE BY: A. BOSTWICK DATE: 1/7/92
CHECKED BY: [illegible] DATE: [illegible]
FILE NO. 908449C

EAST-WEST GEOLOGIC CROSS SECTION
OLIN BASIN

FIGURE 1